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the drawing is the work of an artist, displaying an accuracy not seen in any of the other Mexican codices. It has been hidden from the world in the recesses of the library of the Chamber of Deputies, Paris. The writer had the privilege of carefully examining it in 1895, in company with the Duke of Loubat, through whose generosity its publication has been made possible. The bright colors with which it was painted are still well preserved, and the whole codex is in excellent condition. The first two pages and probably the last two are missing, undoubtedly having been destroyed, or abstracted shortly subsequent to the conquest. The division and mutilation of the Mexican codices is a well-known fact. This book, folded screen fashion, is painted upon but one side, unlike the majority of the Pre-Columbian codices. The pages bear texts written in poor Spanish, partly explanatory of their meaning. The first 18 pages contain the *Tonalamatl*, the divinatory or astrological calendar of the Aztecs. The contents of the missing first two pages can be supplied by a study of the other ritualistic calendars, of the Codices Vaticanus 3773, Vaticanus 3738, Borgianus, Bologna and the Boturini-Aubin-Goupil *Tonalamatl*. This subject has been exhaustively treated by Dr. Ed. Seler. The *Tonalamatl* of the Codex Borbonicus is far more complete than any other yet published, and helps to clear up some of their obscure points. Pages 19 to 38 contain astronomical, religious and historical material of great interest, and somewhat resemble the paintings found in the Codex Telleriano Remensis of the National Library, Paris, and its counterpart Codex Vaticanus 3738. Pages 37 to 38 are instructive from the historical standpoint. Page 37 represents the two prophets who foretold to Montezuma the coming of the Spaniards to subdue the country. The dates: 1, Tochtli; 2, Acatl; 3, Tecpatl, 1506-7-3, accompany these figures, and suggest that the priests had heard of the appearance of the ships of Diaz de Solis and Pinzon off the coast of Yucatan in 1506, notice of which was undoubtedly carried to most parts of the culture area.

When all the old Mexican codices are reproduced separately then the study will be much simplified, and it is gratifying to note the progress now being made in this direction, at

the present time several unpublished codices being in process of publication.

M. H. SAVILLE.

Pflanzengeographie auf Physiologischer Grundlage. Von DR. A. F. W. SCHIMPER. Mit 502 Tafeln und Abbildungen in autotypie, 5 Tafeln in Lichtdruck, und 4 geographischen Karten. Jena, Gustav Fischer. 1898. 8vo. Pp. vi + 876.

The appearance of this text marks a distinctive period in the development of phytogeography. The treatment is primarily ecological, but the floristic is presented so fully and woven in so logically that the arrangement is strictly phytogeographical in the best sense. Such a coordinate presentation of the subject-matter is novel. The standard texts, especially such classic ones as Humboldt's, De Candolle's and Grisebach's, have been almost wholly floristic, while Warming's recent *Lehrbuch der Oekologischen Pflanzengeographie* is, of course, purely ecological. Sketches of particular floras have, likewise, been floristic in character, to the practical exclusion of the ecological standpoint. Naturally, this does not mean that the author is the first to perceive the essential relation between floristic and ecology, a relation practically of cause and effect. The recognition of this fact is as old as Humboldt's first work. It does indicate, however, the advance made in systematizing and in making more thorough the methods of investigating the floral covering. The appearance of the present excellent text evidences the author's realization of his opportunity. The skillful manner in which the matter is handled bespeaks no small mastery of the subject. The volume contains a number of original and suggestive ideas, only a few of which can be mentioned here.

The work consists of three parts, the first treating of the factors in ecology, the second of formations and plant societies, the third of the zones and regions of the floral covering of the globe. The ecological factors considered in the first part are water, temperature, light, soil, atmosphere and animals. The treatment of each subject is as exhaustive as can be expected in a general text, especially in consideration of the enormous mass of detail available. In thorough-

ness and in manner of presentation of this portion, the book is probably without an equal. With respect to water content as a factor, Schimper's divisions agree with those of Warming, except that he uses the term *tropophyte* for *mesophyte* to apply to all plants not *hydrophytes* or *xerophytes*. The same criticism applies here that has been made elsewhere against Warming's *mesophytes*. The term is a convenient one, but it designates an ill-defined group and is almost impossible in application. The analysis of the conditions producing *xerophytes* is critical; such conditions are here grouped with reference to decrease of absorption and increase of transpiration. Under the former are ranged small water content, abundance of salts or humic acid in the soil, low soil temperature; under the latter, low degrees of humidity of the air, high temperature, low atmospheric pressure, intense illumination. Corresponding to these characteristics, *xerophytic* habitats are: (1) deserts and steppes, with a dry substratum and a dry atmosphere, often, also, with excessive heat and intense sunlight; (2) rocks and tree trunks, with low water content due to rapid drying; (3) sandhills, rubble, talus, with extremely porous soil; (4) seashore, solfatara, with abundant salts in solution in the soil; (5) moors, with humic acid in the soil; (6) polar areas, either in glaciated mountain ranges or in arctic latitudes, with extremely low ground temperature; (7) alpine mountains with rarefaction of the atmosphere and strong insolation. The consideration of *hydrophytes* and *tropophytes* is naturally much more restricted. Schimper regards water plants proper as descended from primitive unstable amphibious forms—a conclusion rather too theoretical to be generally accepted. He closes this section with a condensed statement of the relation of water to reproduction and to dissemination.

In the consideration of temperature the author expressly states that he regards this factor of primary importance. He places its treatment after that of water solely because the modifications due to the latter are more easily investigated and determined. The consideration of temperature extremes is followed by that of optimum temperatures, in which the work of Sachs and Haberlandt is largely drawn upon.

Acclimatization is touched upon only briefly, for the most part with reference to Mayr's contributions. For the general reader one or two re-statements are interesting: that no portion of the earth's surface is too cold for plant life, as, with few exceptions, no portion is too hot; that it is nowhere too dark, nowhere too bright, for plant life. There is opportunity to take exception to the sweeping nature of these statements, but they are hardly intended to be taken as absolute. Under atmosphere is considered atmospheric pressure, air content of water and winds. The relatively much greater effect of the wind upon woody formations is pointed out, as also the influence of the wind upon transpiration. No mention is made, however, of the action of the wind in dune regions, sandhills and deserts, where it plays a primary rôle in the determination of the floral covering. The importance of winds in pollination and dissemination is treated briefly.

The chapter upon soil as an ecological factor is very skillfully summarized. Though brief, it is so comprehensive that recapitulation is impossible here; one can only reaffirm its excellence. The influence of animals upon vegetation has not been given as much attention as would be expected. Too little use has been made of the vast accumulation of data in this field. In many instances the ecological significance has not been fully wrought out. Moreover, a large number of important biological factors in ecology, arising from the interrelations of plants to plants, and of plants to the physical conditions, such as vegetation pressure, zonation, layering, etc., have been entirely neglected.

It is impossible to accept the author's grouping of formations into climatic and edaphic in the absolute way he seems to intend it. Forests, prairies and deserts are not purely, nor always primarily, determined by climatic factors. The so-called edaphic formations, determined though they are by soil characteristic, are often not formations, but zones or patches. They are but rarely coordinate with the author's climatic formations. The conception of the facies, moreover, differs from that of Drude, which has been accepted in this country. The division of the floral covering into forests,

prairies or steppes and deserts is, of course, primary and affords an altogether satisfactory basis for the arrangement of the formations. The statement that the constitution of the floral covering is determined by the three factors, temperature, hydrometeors and soil, is axiomatic; one is inclined, however, to give only partial assent to the conclusion that temperature determines the flora, hydrometeors the vegetation, and soil composition the formation. The analysis of the determining factors of forest, prairie and desert vegetation is excellent. Moderate frequency of precipitation is of first importance for forest vegetation. A rainy growing period is less favorable, the primary requisite being considerable water content in the soil, especially at some depth. The time of year in which the water supply is replenished is unimportant. The latter may occur throughout the year or only periodically. In the last case the rainy season may coincide for the most part, or entirely, with the growing period, as in the tropics and in the interior of Argentina, or with a period of relative rest, as in extra-tropical regions with wet winters, Mediterranean countries, Chili, California, south and southwest Australia. Forests are limited only by such degrees of dryness as prohibit all other vegetation, with the exception of fungi and algæ. The polar limit of forested areas is determined by dry winds during the season of frosts. Summarizing, a climate favorable to forestation presents the following conditions: warm growing period, constantly moist substratum, moist, quiet atmosphere, particularly in winter. It is unimportant whether the water content of the soil is supplied from meteoric or telluric sources, whether the precipitation is frequent or rare, coincident with the growing period or the period of rest. A climate with dry winters is unfavorable to forests in the highest degree, since the trees are unable to recover from the transpiration loss of the winter.

For prairies and steppes a moist substratum is unimportant, but a moist upper surface is essential. The most favorable conditions for grass vegetation are frequent, if only slight, precipitation during the growing period and concomitant moderate warmth. Prairies are affected little by the moisture of the substratum,

except in the case of extreme capillarity of the surface, by the dryness of the air, especially during the period of rest, and by winds. Dryness in the maximum of the growing period, spring and early summer, is inimical, in a high degree, to grass vegetation. Axiomatically, in a climate favorable to forestation, forests predominate; in one favorable to grasses, prairies and steppes are the rule. In transition regions predominance is determined by adaptation to edaphic factors. Extreme departures from the mean favorable to forest or to prairie vegetation produce deserts.

It is impossible even to touch upon the third part of the volume, which constitutes by far the largest portion. It deals with the zones and regions of the vegetative covering of the earth. The latter is treated in the most exhaustive manner since Grisebach under the captions: tropical zone, temperate zone, arctic zone, montane regions and hydrophytic formations. Each zone is considered in a very logical manner with reference to the three main manifestations of the vegetation, forest, prairie and desert. The high value of the text is greatly enhanced by the large number of fine illustrations. It seems impossible to commend too highly this marked feature of the book. It may be regarded as significant of the time when phytogeographical results will be embodied, for the most part, in graphic fashion, in photographs, abundance-frequency indices and charts, and formational lists and contrasts.

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Victor von Richter's Organic Chemistry. Edited by Professor R. ANSCHÜTZ, University of Bonn. Authorized Translation by EDGAR F. SMITH, Professor of Chemistry, University of Pennsylvania. Third American from the eighth German edition. Vol. I., Chemistry of the Aliphatic Series. Philadelphia, P. Blakiston's Sons & Co. 1899. Pp. 625. Price, \$3.

Anschütz, in editing v. Richter's 'Organic Chemistry,' has raised it from the rank of a good descriptive manual to a place in the front rank of books on this subject. He has had the aid of Emil Fischer in the supervision of the chapters